

## CLAIMS

What is claimed is:

1. A method of controlling the output of a power amplifier to prevent loop saturation, the method comprising the steps of:
  - 5 detecting the output signal of the power amplifier;
  - converting the detected output signal from analog to digital;
  - conducting a transformation on the digital signal to obtain the frequency characteristics of the signal;
  - comparing the power of the signal at a particular frequency to a threshold
  - 10 value; and
  - adjusting the output of the power amplifier based on the comparison of the power of the signal and the threshold value.
2. The method of claim 1, wherein the transformation of the digital signal is performed by conducting a Fast Fourier Transform.
- 15 3. The method of claim 1, wherein the particular frequency is approximately 400kHz and the step of comparing the power of the signal to the threshold value is performed by examining the power of the signal at 400kHz.
4. The method of claim 1, wherein the step of detecting the output signal of the amplifier is performed during the ramp up time of the power amplifier.
- 20 5. The method of claim 1, wherein the step of detecting the output signal of the amplifier is performed during the ramp down time of the power amplifier.
6. The method of claim 1, wherein the power amplifier transmits during a time slot and the step of detecting the output signal of the amplifier is performed only during a portion of the time slot.
- 25 7. The method of claim 1, wherein the step of adjusting the output of the power amplifier further comprises the steps of:
  - generating a ramp voltage;
  - detecting a supply signal, the supply signal being related to the level of the supply voltage provided to the power amplifier;
  - 30 decreasing the supply voltage to the power amplifier when the supply signal approaches the ramp voltage; and
  - changing the value of the ramp voltage based on the comparison of the power of the signal and the threshold value.

8. The method of claim 7, wherein the ramp voltage is decreased when the power of the signal approaches the threshold value.

9. The method of claim 7, wherein the ramp voltage is increased when the power of the signal is below the threshold value.

5 10. The method of claim 7, wherein power amplifier is powered by a battery and the ramp voltage is modified based on the current voltage level of the battery.

11. The method of claim 7, wherein the temperature of the power amplifier is monitored and the ramp voltage is modified based on the current temperature of the power amplifier.

10 12. The method of claim 1, wherein the step of adjusting the output of the power amplifier further comprises the steps of:

generating a bias voltage to drive the power amplifier; and

changing the value of the bias voltage based on the comparison of the power of the signal and the threshold value.

15 13. An apparatus for controlling the output of a power amplifier to prevent loop saturation, the apparatus comprising:

a voltage detector coupled to the output of the power amplifier and operative to detect the output signal of the power amplifier;

20 an analog to digital converter for converting the detected output signal from analog to digital;

a processor operative to:

convert at least a portion of the detected digital signal into the frequency domain;

25 compare the power of the converted signal at a particular frequency to a threshold value; and

adjusting the output of the power amplifier based on the results of the comparison.

14. The apparatus of claim 13, wherein the analog to digital converter and the processor are included in a base band processor.

30 15. The apparatus of claim 14, wherein the processor includes a Fast Fourier Transform function and is operative to convert at least a portion of the detected digital signal by conducting a Fast Fourier Transform.

16. The apparatus of claim 15, wherein the base band processor includes a ramp voltage output and the processor is operative to adjust the output of the power amplifier by providing the ramp voltage to an integrator that compares a supply signal representative of a supply voltage to the power amplifier with the ramp voltage and decreases the supply voltage to the power amplifier when the supply signal approaches the ramp voltage.

17. The apparatus of claim 15, wherein the base band processor includes a bias voltage output and the processor is operative to adjust the output of the power amplifier by providing adjusting the value of the bias voltage.

18. A mobile station for use in a cellular system, the mobile station comprising:  
a power amplifier having an output signal;  
a voltage detector coupled to the output of the power amplifier for detecting the output signal and having a detected signal output;  
an analog to digital converter electrically coupled to the output of the voltage detector for receiving the detected signal and for converting the detected signal from analog to a digital signal and providing the digital signal to a digital output;  
a processor coupled to output of the analog to digital converter for receiving the digital output, the processor being operative to:  
convert at least a portion of the digital signal into the frequency domain;  
compare the power of the converted signal at a particular frequency to a threshold value; and  
adjusting the output of the power amplifier based on the comparison.

19. The mobile station of claim 18, wherein the voltage detector includes a coupler that obtains a signal that is as low as -30dB (1/1000) of the output signal.

20. The mobile station of claim 19, wherein the coupler is etched into a circuit board housing the voltage detector.